PATENT SPECIFICATION

Convention Date (United States): April 15, 1927. **288,616**

Application Date (In United Kingdom): June 14, 1927. No. 15,859/27.

Complete Accepted: Sept. 6, 1928.

COMPLETE SPECIFICATION.

Improvements in or relating to Sheet Feeding Mechanism.

We, AMERICAN TYPE FOUNDERS COMPANY, of 710, West Grand Street, Elizabeth, New Jersey, United States of America, a corporation organised and existing under the laws of the State of New Jersey, Assignees of WILLIAM MURPHY KELLY, citizen of the United States of America, of Westfield, County of Union, State of New Jersey, United States of America, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

The present invention relates to automatic sheet feeders, and particularly to suction devices for intermittently lifting sheets from a pile, of the type comprising a suction wheel for advancing the sheets and a suction lifting device for bringing the sheets under the influence of the advancing means.

In our prior Specification No. 240,145, there is disclosed an automatic sheet feeder having means including suction wheels to feed the sheets forwardly and a single suction device mounted for vertical reciprocation and so disposed as to grip each sheet to be fed at about the centre of its forward edge and bring it under the influence of the forwarding means.

The object sought to be accomplished, in general by the present invention, is to provide suction devices for lifting sheets singly from a pile, which are certain in operation, simple in construction and flexible as to adjustment. To these ends, the invention consists in a suction sheet feeding mechanism comprising in combination with a suction sheet forwarding device of the kind described suction means for lifting sheets singly to said forwarding means, comprising suction tubes mounted for vertical reciprocation in a rectilinear path and disposed in lateral alignment over the forward edge of a sheet pile. The vertically reciprocating suction tubes fully support the entire forward edge of the sheet when the latter is being lifted, whereby the sheet does not sag at any point and is properly positioned for feeding forward to the conveyor. The outer of the suction tubes are preferably mounted so as to be laterally adjustable in conformity with the width of the sheet being operated on.

Other objects and features of novelty will be apparent from the following description taken in connection with the drawings, in which:

Figure 1 is a plan view of a portion of an automatic feeder provided with the present improvements;

Figure 2 is a vertical longitudinal sectional view taken substantially on the line 2—2 of Figure 1; and

Figures 3, 4 and 5 are, respectively, a vertical section, a rear elevation and a plan view of one of the suction lifters.

Figs. 1 and 2 show only so much of an automatic feeder, of the type shewn in the patent referred to above, as is desirable to illustrate the application of the present invention. The frame of the feeder is designated by the numeral 10, the feed board by 11, and the pile table by 12. The elevation of the pile is automatically maintained by mechanism including a feeler 13 which rests on top of the pile and is connected to mechanism for throwing into operation table lifting devices, including sprocket wheels 14 on a cross shaft 15, whenever the elevation of the pile sinks to a certain point. A cross shaft 16 carries a pair of suction wheels 17 which project slightly beneath a stripper plate 18 and are formed with apertured flanges to which suction is applied, whereby the wheels are adapted to feed forward the sheets lifted from the pile into the influence thereof. The sheets are thus fed forward over a bridge plate 19 to the tapes 20 which convey them over the feed table 11. A fuller understanding of the construction and operation of the parts referred to may be had from a study of the above mentioned patent.

The present invention is directed particularly to suction devices for lifting sheets singly from the pile to the sheet forwarding means, which may be the suction wheels 17. As shown in Fig. 1,

[*Price* 1/-]

there are four spaced suction lifters arranged in lateral alignment over the forward edge of the sheet pile, two on each side of the suction wheels 17. The outer of these lifters, designated generally by the reference character A, are laterally adjustable, while the two inner lifters B are fixed in position. The outer lifters (Figures 3, 4 and 5) include housings 21 attached by screws 22 to rectangular bars 23 which carry adjustable corner guides 24 (Figure 1) engaging the outer corners of the sheet pile. Bars 23 are secured to brackets 25, which are slidably mounted on a cross bar 26 and are adapted to be secured in adjusted positions thereon by thumb screws 27. Thus when the brackets 25 are adjusted on bar 26, for sheets of different width, the corner guides 24 and the lifters A are correspondingly moved, so that, whatever the width of the sheet, the lifters A will be positioned over the forward corners thereof.

The housings 21^1 (Figure 2) of the inner lifters B are formed with foot portions 28 secured by screws 29 to the stripper plate 18, the plate being apertured as shown in Fig. 2, to permit the suction lifters to project therethrough. With the exception of the attaching means of the housings, referred to, the housings and the parts associated therewith are all identical, and therefore a description of one of these housings and associated parts will serve for all.

Referring to Figures 3, 4 and 5, which illustrate one of the outer lifters, the housing 21 is formed with a vertical bore 30 extending entirely therethrough; with a horizontal bore 31 extending from one side of the housing to the vertical bore; and with a short vertical bore 32 open at the top and communicating at the bottom with the horizontal bore 31. The outer end of horizontal bore 31 is closed by a plug 33; a tube 34 is fixed in the vertical bore 32; and a tube 35 is reciprocable in the vertical bore 30. Tube 35 is integral at its upper end with a solid stem 36 which is formed with a keyway 37 engaged by a key 38 fixed in the housing. The upper end of stem 36 is reduced and threaded, and an arm 39 is clamped thereon by a nut 40. A pin 41, threaded in the end of arm 39 is connected by a tension spring 42 to a pin 43 threaded in the housing near its lower end; the spring tending to move the tube downwards. Secured to the lower end of tube 35 is a nozzle 44 formed of soft rubber, flared at a wide angle and having its material tapered in thickness to the rim, which is very thin, this construction adapting the nozzle to conform closely with any irregularity in the surface of the sheet, thereby insuring a full suction effect and firm grasping of the sheet. The wall of tube 35 is slotted to form a port 45 which communicates with an aperture 46 in the housing when the tube is in its upper position, and communicates with the horizontal bore 31 when the tube is lowered to the dotted line position shown in Fig. 3. Tube 34 is connected by a flexible tube or hose 47 to a distributing head 48, which is secured on and communicates with the interior of a suction pipe 49 connected to a suitable pump (not shewn). This distributing head is provided with four nipples for connection with pipes 47 leading to the two outer lifters A, and to the pipes 47^1 leading to the two inner lifters B.

The four tubes 35 are synchronously operated by mechanism including a transverse rock shaft 50. This shaft is journaled at its outer ends in the frame 10 and centrally in a bracket 51 which is bolted to a square cross bar 52. Fixed on shaft 50, between the arms of bracket 51, is an arm 53 carrying a roller 54 which engages a cam 55 on a cross shaft 56, the latter being the cam shaft of the machine and carrying the several operating cams for the various sheet handling and controlling mechanisms of the feeder. At each side of the suction wheels, rock shaft 50 carries two arms, each designated by the numeral 57, the pair of arms at each side carrying at their outer ends a rod 58 which extends under the arms 39 secured to the suction tube stems.

In operation, the tubes 35 are intermittently lowered and raised in synchronism, lifting the sheets at the forward edges at four spaced points, two of which are at the forward corners of the sheet and two at each side of the center, the said points being substantially equispaced; so that the sheet is perfectly supported, and its feeding forward by the suction wheels to the conveyor tapes in proper registry is assured. As shown in Figures 2 and 3, the suction tube is at the limit of its upper movement, having been brought to this position against the tension of spring 42 by the upward movement of rod 58 due to the travel of roller 54 on the high part of cam 55. In this position the port 45 is in communication with the aperture 46 and the tube is cut off from the suction in bore 31. In Figure 2 the cam is rotating in a clock-wise direction, and it will be observed from the shape of this cam that the tube will first be lowered slightly and will then be quickly lowered to its limit in this direction. In the lowered position of the tube, shown in

dotted lines in Figure 3, the nozzle 44 firmly seats on the top sheet of the pile, the flexible character of the nozzle adapting it to conform with any irregularities in the surface of the sheet or to small differences in elevation of the sheet pile. In this position the port 45 in the tube is opposite the bore 31, so that the interior of the tube is subjected to the full suction effect and the sheet firmly adheres to the nozzle. The tube remains in this lowered position only for a brief instant, as will be apparent from the shape of the cam, being quickly raised to its upper position as the roller 54 rides over the abrupt surface *x* to the high part of the cam. When the tube nears its upper limit, port 45 comes into communication with aperture 46, so that the suction in the tube is broken and the sheet is released, being fed forward by the suction wheels 17. These wheels of course support the sheet only at points near the center line thereof, and although the suction in the tubes is broken at the instant the sheet is taken by the wheels, the sheet will not drop from the tubes to any substantial extent while being fed forward by the suction wheels, since the feeding velocity is very rapid.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim is:—

1. Sheet feeding mechanism comprising, in combination with a suction sheet forwarding device of the kind described, suction means for lifting sheets single to said forwarding device comprising suction tubes mounted for vertical reciprocation in a rectilinear path and disposed in lateral alignment over the forward edge of a sheet pile.

2. Sheet feeding mechanism according to Claim 1 comprising in combination means for reciprocating said tubes vertically, means for subjecting said tubes to suction when in their lower positions, and means for breaking said suction when the tubes are raised.

3. Sheet feeding mechanism according to Claim 1 or Claim 2 wherein the sheet forwarding means comprises a pair of suction wheels, and wherein the suction means for lifting sheets singly into the influence of said suction wheels comprises suction tubes mounted at the sides of said suction wheels.

4. Sheet feeding mechanism according to Claim 1 or 2 wherein the sheet forwarding means comprises a pair of suction wheels and wherein the suction means for lifting sheets singly into the influence of said wheels comprising a plurality of suction tubes mounted at each side of said suction wheels.

5. Sheet feeding mechanism according to Claim 4 comprising means for laterally adjusting the outer of said tubes.

6. Sheet feeding mechanism according to any one of the foregoing claims comprising means to vertically reciprocate the suction tubes, comprising a transverse rock shaft mounted in front of the sheet forwarding means and the said tubes, an arm rigid on said shaft, a cam engaging said arm, and connections between said shaft and tubes whereby the latter are synchronously operated when said shaft is rocked.

7. A sheet feeding mechanism according to the preceding claim having rearwardly extending arms on the transverse rock shaft, transverse rods carried in the free ends of said last mentioned arms engaging the suction tubes and adapted to lift the same synchronously, and springs tending to move said tubes downwardly.

8. A sheet feeding mechanism according to any one of the foregoing claims, having in combination, a feed table adapted to support a pile of sheets, a stripper plate over said table, sheet forwarding means projecting slightly below said stripper plate, a suction tube housing at each side of said means and having foot portions secured on said stripper plate, and suction tubes in said housings projecting through apertures in said plate.

9. Sheet feeding mechanism according to Claim 8 having in combination longitudinal rods supported for lateral adjustment above the feed table, and corner guides for the sheet pile mounted on said rods adjacent the rear ends thereof.

10. Sheet feeding mechanism according to any of the foregoing claims, comprising in combination with each of the suction tubes a housing therefor having a vertical bore and a suction chamber opening thereinto and communicating with the suction tube when said tube is lowered and an aperture in said housing opening into the said bore and communicating with the suction tube when the latter is raised.

11. Sheet feeding mechanism according to any one of the foregoing claims in which the suction tubes are each provided with a nozzle formed of soft rubber, flared at a wide angle, and having the material tapered to the rim, which is very thin.

12. The sheet feeding mechanism substantially as described or substantially as illustrated in the accompanying drawings.

Dated this 13th day of June, 1927.

AMERICAN TYPE FOUNDERS COMPANY,
Per Boult, Wade & Tennant,
111 & 112, Hatton Garden, London,
E.C. 1,
Chartered Patent Agents.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig. 1.

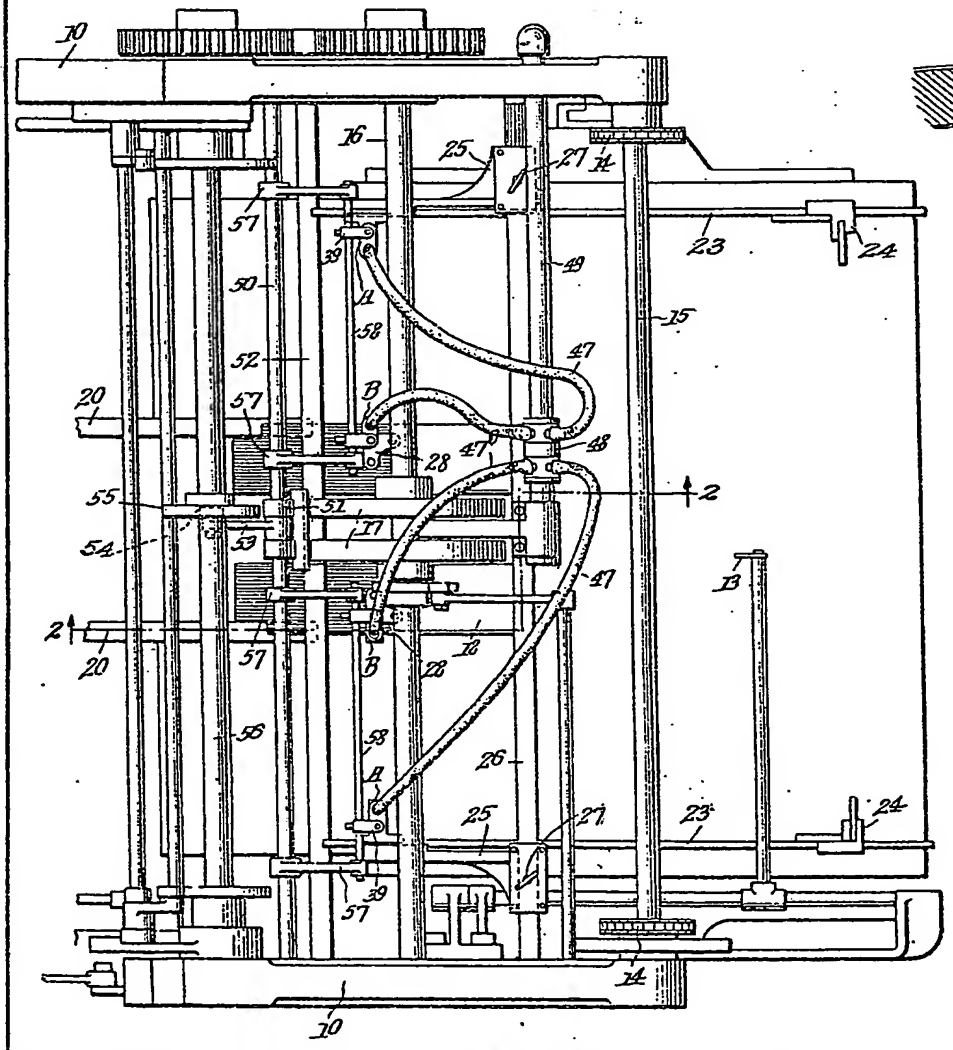
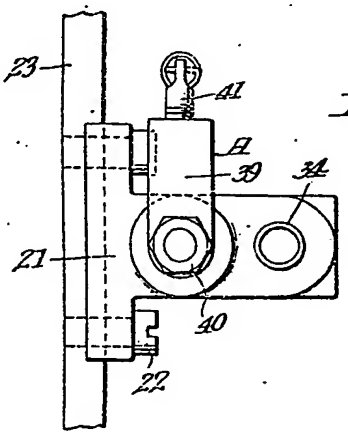
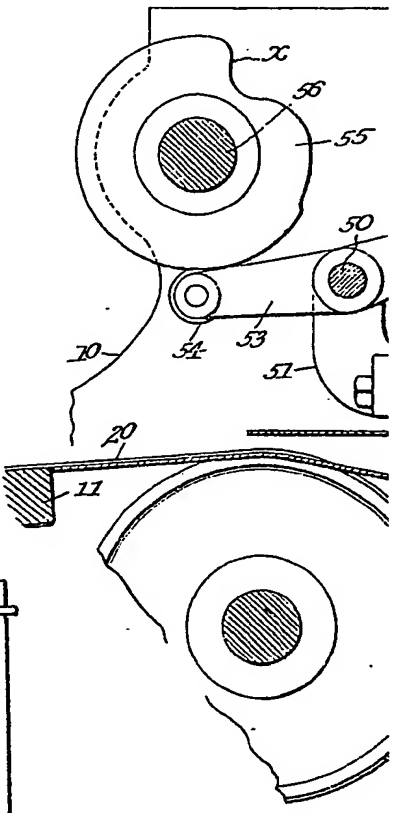


Fig. 5.





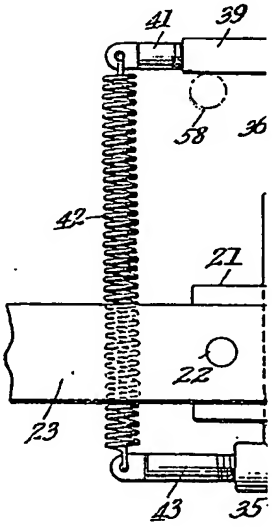


Fig. 2.

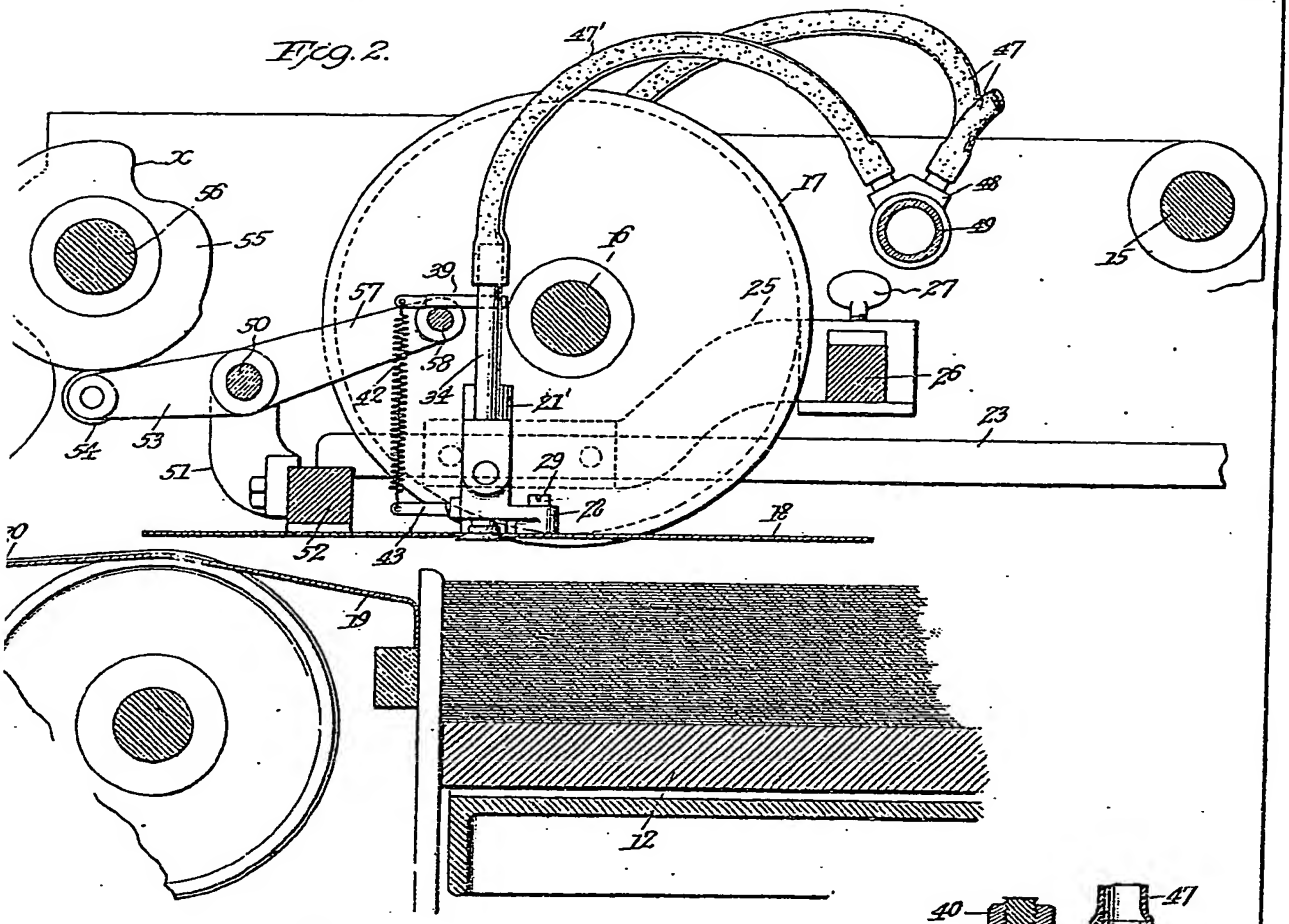


Fig. 4.

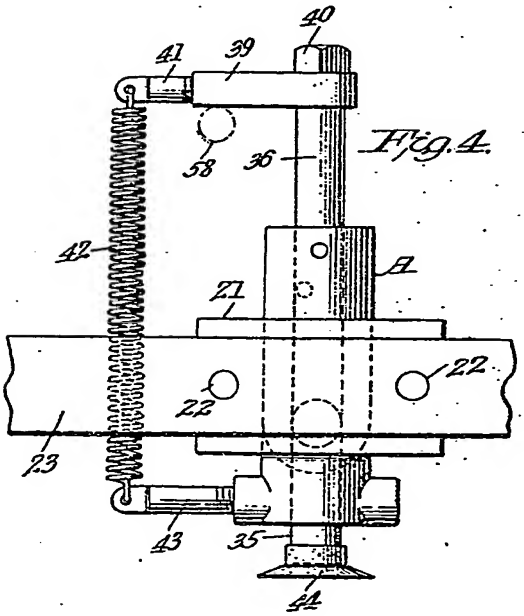


Fig. 3.

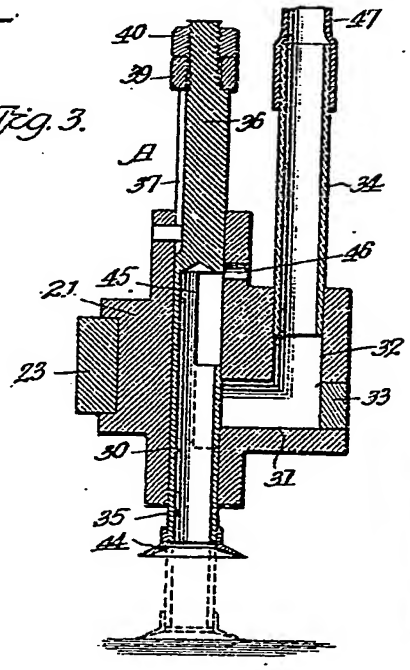


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Fig. 1.

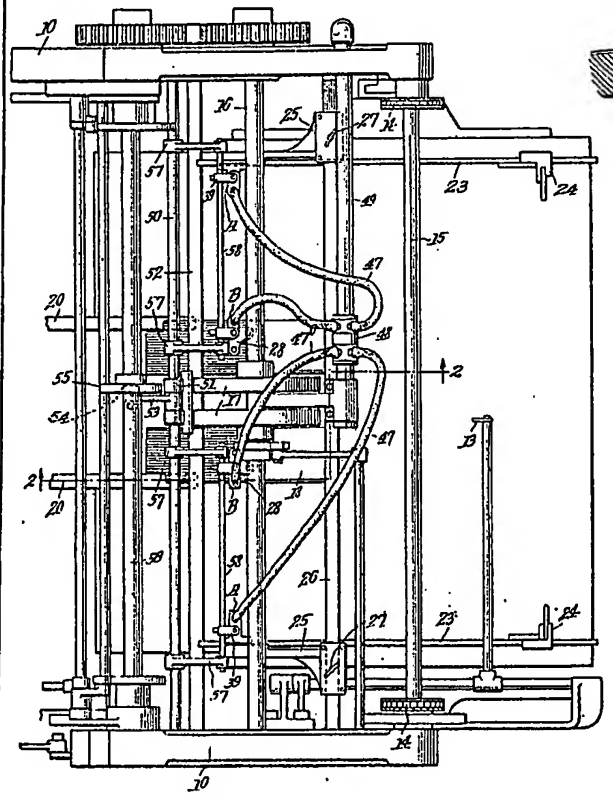


Fig. 2.

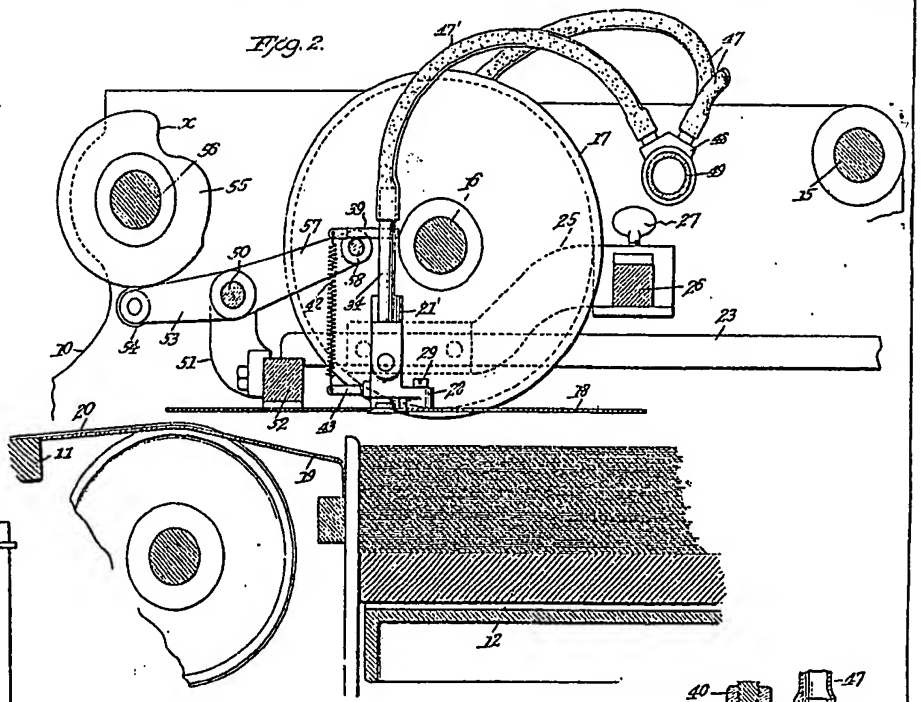


Fig. 5.

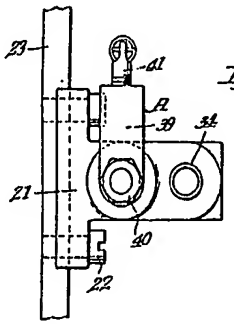


Fig. 4.

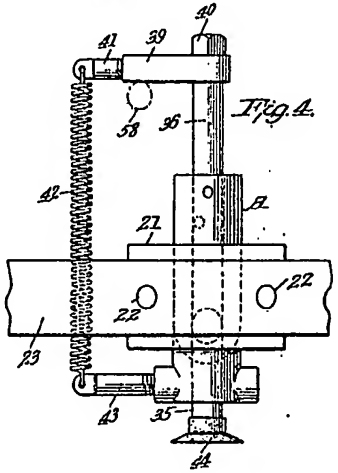
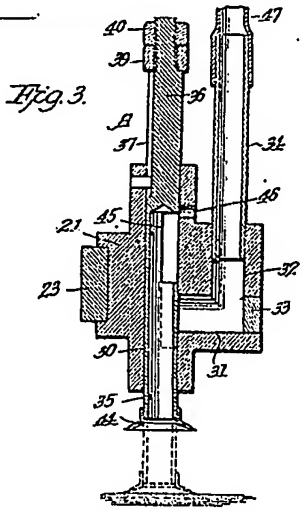


Fig. 3.



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